4. The presence, in the absence of valvular disease, of signs of decompensation, as edema of the lungs or of the extremities, whether at rest or after exercise.

5. Weakening of the first sound at the apex, resulting from the effort test.

6. Increased strength of the first sound over the right ventricle as compared with the first sound at the apex, occurring after exertion.

7. Weakened first sound at the apex, at rest, in the absence of emphysema.

8. The production, following the effort test, of irregular heart action or the increase in irregularity, already present, brought on by exertion.

9. Loss or weakening of the second sound at the apex, due to exercise.

III. Variations in the systolic, in the diastolic or in the pulse-pressures are believed to give relatively little information regarding the cardiac function.

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ADVANCEMENT IN THE TREATMENT OF WOUNDS AND INFECTIONS RESULTING FROM THE WAR.

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What effect will the experiences of surgeons during the war have on the civil practice of surgery? Has the treatment of wounds been revolutionized? Has any new antiseptic been discovered since the beginning of the war which will prevent or arrest infection? Will experience in the treatment of war wounds change our treatment of wounds in civil practice? What have the men who have been working in military hospitals really learned?

These are the questions which one has constantly put to him by members of the profession and by intelligent and inquiring laymen, and, although the answers cannot always be categorical or perhaps satisfying, yet it has seemed worth while, now that the war has terminated, to take stock of our experiences and to try to estimate of what real value they have been. In doing this I shall endeavor to bear in mind that only a small proportion of my readers are surgeons and yet that all are interested in a general way in this subject. The field is a large one, any portion of which is worthy of high-powered study, but it will be looked upon on this occasion as a whole, and with but a very low lens.

First, it may be said without question that, as a result of this war, the treatment of wounds and infections has been advanced enormously and that this advancement must undoubtedly influence the practice of civil surgery.

Again, it may be said that the man who found himself in a position to carry out the treatment of wounds in the advanced hospitals, or even in the base hospitals alone, had at least an opportunity to learn a great deal and should benefit greatly from his military experience.

The men who served their country without being fortunate enough to do so in the field of their particular medical or surgical training and experience, the men who filled executive positions or acted as regimental surgeons, made much more of a sacrifice and deserve much more credit than those of us engaged in that line of medicine or surgery in which we were interested before the war and which we expect to follow now that the war is over. It is true then that he who made the greatest sacrifice is the one who will gain the least, from a professional point of view, by his experience.

As to the question of new antiseptics, there is not nor will there ever be an antiseptic that can supplant the aseptic treatment of wounds; that is, there is nothing we can use which alone will prevent a contaminated dirty wound, probably containing foreign bodies, from becoming an infected and suppurating wound. The war has definitely taught one great lesson in the prevention of wound infection, it is immediate and complete mechanical cleansing, what the French call débridement, what we might call mechanical antisepsis. It is difficult to find a single term to express just what this means; the word "excision" has been employed a great deal and Crile has made use of the term "revision," but neither, and certainly not the latter, is a comprehensive term. This mechanical cleansing is the most important step in wound treatment and the care with which it is carried out determines the proportion of wounds which may be immediately and completely closed and the proportion of infections and deaths from infections. Time and technic are the factors in the beginning. To close a wound immediately and completely it must be prepared for this closure with care and thoroughness; there must be the certain removal of all foreign materials and of all injured and contaminated tissue. Immediate débridement and complete primary suture without the use of chemical antiseptics constitutes the ideal treatment of a gunshot wound, and it is remarkable what results may be accomplished with care and experience. Before this war no one would have dared in operating upon a gunshot wound to have closed the wound without a drain, and if he had done so there can be little doubt that a serious infection would have followed: and yet this is exactly what was being done in hundreds of cases every day during the last year or two of the war, not because of the employment of any germicidal agent, but through the practice of painstaking removal of everything in the wound which might infect it.

But there must of necessity be a large majority of wounds which cannot be immediately closed; the lapse of sufficient time for infection to occur between the receipt of the wound and the operation, say ten to fifteen hours, varying with the situation and character of the wound, the presence of comminuted bone and the necessity for immediate transportation, all render immediate suture unsafe. In order to render the ideal treatment possible, these wounds must be treated before contamination has produced an infection and the surgeon must be able to keep the patient under his immediate observation for at least two weeks. It is apparent then that it is during the so-called "quiet periods" that the best work can be accomplished; but even during the times of the greatest activity, with sufficient surgical teams, thorough débridement or mechanical cleansing can be accomplished and the closure of the wound may be done later when the patient has reached a hospital where he can remain until healing is complete.

One of the difficult things to give up was partial closure of wounds with the introduction of some form of drainage. Partial closure is an error, however, because it is much easier to sterilize and close a wound secondarily which has been left wide open than one which is partially closed with a drain. Hundreds of wounds were closed by what is called "retarded primary suture" within three or four days at a base hospital after an early débridement done nearer the front. Before this war, sterilization and closure of a large suppurating wound was rarely thought of and still more rarely practised, and yet this was the object of all treatment at the close of the war; and, moreover, it was accomplished in the large majority of cases.

Primarily the credit of successful wound sterilization is due to Carrel and Dakin, but certainly the surgeons in the American service owe much to Depage, Le Maistre, Duval and others who have elaborated or simplified the technic.

Here, again, just as in the primary operation, the success of the treatment depends upon the care with which it is carried out. Half-hearted effort only results in indifferent success. It was remarkable to see the different results obtained by different men and in different hospitals where exactly the same types of wounds were treated and supposedly the same method of treatment employed.

The most important factor in this sterilization is the thoroughness with which the primary operation is done, for if the surgeon should leave any foreign material, such as a piece of metal or a portion of clothing, or even a portion of devitalized tissue, sterilization becomes difficult or impossible; and the second most important factor is the proper employment of the sterilizing agents. In the American hospitals where the best results were obtained the Carrel-Dakin treatment was employed. If this treatment was properly used, practically any wound free from foreign material was sterilized and closed.

The Carrel-Dakin treatment in infected wounds is one of the big things surgery has gained by the war, and the man who says there is nothing in it, that it is too cumbersome or that there are a number of other methods just as good, has either never seen a hospital where the treatment was being properly used or else he is so hidebound that his opinion is worthless. I am afraid a number of American surgeons had this idea upon their arrival in France, but I am thankful to say that most of them became early converts to the method, and those who did not certainly were never able to produce results comparable to those obtained by the men who perfected themselves in the employment of the method. I never appreciated what this treatment was capable of accomplishing until I saw it properly employed in Carrel's own hospital at Compiègne, and then I was ashamed of my own wards. His wards contained scores of cases with large open wounds in the process of sterilization, and rarely was there a drop of pus to be seen. By adhering closely to the Carrel and Depage technic I am thankful to say we were able later in a number of our hospitals to duplicate their results.

I am not prepared to say that other agents, such as dichloramin-T, will not sterilize infected wounds, but I do think that there is no method so universally applicable and reliable as the Carrel-Dakin treatment, and this statement is not made on personal experience alone, but also on a fairly wide observation in many American, French and British hospitals.

There are two criteria for judging the germicidal power of any of these agents—the fall in the bacterial count, as shown in smears and cultures, and the ability to close the wound completely. No method that cannot stand these tests is worthy of consideration. In my opinion the bacteriologist is an absolutely essential factor in retarded primary and secondary closure of wounds, and I say this in spite of the fact that many surgeons became very expert in determining by clinical evidence only what wounds might be safely closed.

In no field of war surgery has the advance been so remarkable as in the treatment of gunshot wounds of joints. These wounds in our own Civil War were always treated by amputation or followed by severe infection, which frequently caused death or necessitated amputation. Up to the beginning of this war any surgeon who operated upon a gunshot wound of the knee-joint, for instance, and closed it without drainage would have rendered himself liable to a malpractice suit; and yet at the end of the war a surgeon who did not close such a wound was open to the criticism of not doing up-to-date surgery. The results warrant the change in practice, for drainage invariably meant infection of a more or less serious nature and infection meant more or less incapacitating ankylosis or even worse. I have seen a straight series of ten gunshot wounds of the knee-joint, with fracture in all but one, treated by four surgeons (Pool, McWilliams, Jopson and Heuer) at Evacuation Hospital No. 1, heal by primary union and the patients leave the hospital with movable joints. And still can anyone doubt that surgery has advanced since and as a result of the war?

That these results can and must be obtained in civil practice is equally patent. Since my return to civil practice I have operated upon a pistol-shot wound of the knee-joint in which one ball perforated the head of the fibula, caused a gutter fracture of the condyle and a comminuted fracture of the patella, and another ball entered through the shaft of the fibula and perforated the head of the tibia. Early débridement was done in this case and the wounds closed without drainage. Primary healing took place and the man left the hospital within a few weeks with considerable motion in his knee-joint. I am sure that without my own military experience behind me, or that of others, this man would today still have discharging sinuses and probably a stiff knee-joint.

Another field in which the advance has only been secondary to that of joint surgery is in the treatment of gunshot wounds and infections of the chest. Nothing so much lowers the mortality rate and the percentage of infections in gunshot wounds of the chest as the early débridement and closure of the pleural cavity in all sucking wounds of the chest. Few of the cases of perforating wound, or small penetrating wound, where there was no sucking of air into the pleural cavity with each respiration, were subjected to operation unless subsequent infection of the hemothorax occurred, and in my experience it was surprising to see how small a proportion of the cases of hemothorax became infected. There was a definite practice in our own service that any wound of the chest that was operated upon should not be drained, but the wound completely closed. It must be admitted that a small percentage of these cases broke down or became infected later.

Probably the greatest improvement in the treatment of infections of the pleura we owe largely to Depage, who suggested and practised the sterilization of the pleural cavity by constant irrigation with Dakin's solution. Many of you are familiar with the findings of the Empyema Commission in our camps in this country, and the reading of these reports should be sufficient to convince any doubter of the efficacy of Dakin's solution as a sterilizing agent. If there is an area in the body in which infection is tenacious it is the pleural cavity. These infected cavities can be readily sterilized and the chest wall closed, or allowed to close, with absolute disregard of the cavity itself. Tuffier and Depage have both shown, and hundreds of others have confirmed the observation, that if the cavity is sterile it will remain closed and the lung will expand. This, then, must be our practice in civil life in the treatment of empyema, and when one remembers the prolonged suppuration in these cases and the difficulty of obliterating the cavities by various plastic operations, one must admit that here again we are indebted to military surgery for a great advance.

Gas gangrene early in the war became a formidable enemy and continued so to the end. The gas bacillus was the *bête noir* of the surgeon; it was the cause of more amputations and more deaths than any other organism. Early and complete débridement was the surest means of avoiding the gas infections, but, as this was often impossible, gas gangrene remained prevalent up to the end of the war. Bull's serum was used quite extensively in some of our hospitals, and I believe in some cases it arrested the infection; but in others it had no effect, and in a few the reaction was so severe that it was thought to have hastened an inevitably fatal termination. I cannot speak of its efficiency as a prophylactic agent, though in the latter months of the war I believe it was used quite extensively in the French and British Armies.

An old enemy of the military surgeon, the tetanus bacillus, certainly cut no figure excepting in the early months of the war; that is to say, it was practically wiped out after the use of the prophylactic injections was regularly enforced. I consider it rather remarkable that during the nineteen months spent constantly in surgical work I saw only two cases of tetanus, and neither of these occurred, in the American service. In the early days of the war the French surgeons saw a good many cases of tetanus, but in recent years, with the prophylactic injections in every case of wound, it certainly became the rarest of all infections. One of the two cases I did see occurred in a poor Tommy who was brought into a British clearing station after fourteen days in No Man's Land, and he, of course, did not have the prophylactic injection. This was one of the most pathetic cases that I encountered, and it illustrates, if illustration is needed, that this has been a war in which, owing to the brutality of our enemy, chivalry and humanity were conspicuously absent. Such a thing as a temporary truce for the removal of the wounded was unheard of. This poor man, to whom I have just referred, in spite of an infected wound of the buttock containing clothing, dragged himself from one shell hole to another for fourteen days, living on the food and water which he found on the dead. The most pathetic feature of his case was the fact that although the infected wound of his buttock was being well taken care of and the infection well walled off, he succumbed the day after admission in the agony of tetanic convulsions.

Although we cannot say on reviewing our experiences what the great Ambrose Paré said after recounting his achievements that "There is nothing left for posterity to discover," or of ourselves what Job said of his comforters, "No doubt that wisdom will die with you," yet there can be no doubt that surgery has made strides in certain directions, and that at least some good has come out of this great evil from which the world has suffered during the past four and a half years.

SOME CLINICAL MANIFESTATIONS OF INFLUENZA IN CHILDREN.[1]

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The influenza epidemic of 1918, as it affected New York last fall, cannot be regarded otherwise than as a veritable plague. Nothing like it has been experienced by this generation. The poliomyelitis epidemic of 1916 seems almost insignificant by comparison. Previous epidemics of la grippe we have had ever since 1899, but nothing comparable to this scourge. The disease behaved so differently from any other epidemic that it seems difficult to believe it due to the same microörganism. The pathological findings, moreover, were in many ways very different from those found in other la grippe epidemics.

Two features especially stand out with regard to this epidemic: (1) The wide prevalence of the disease throughout all classes and ages, and (2) the great number and the exceedingly high mortality of the cases with pulmonary complications. Early in the epidemic it was frequently stated that infants and young children escaped the disease, but this was distinctly not true. It was true that the mortality among children was very low compared to that among young adults, and especially as compared to that among pregnant women. But children of all ages were striken with the disease, and, as will be shown later, pneumonia and bronchopneumonia were the common and often fatal complications in all the severe cases.

As to the wide prevalence of the disease among children, I may note that at Bellevue the Children's Medical Division has 140 beds; during the epidemic in October, November and December, 1918, our daily census rose to between 300 and 360, the rise all due to cases of what we must regard as influenza. At times we had as many as 60 admissions per day, and frequently several children of a family would all come in at one time. I recall distinctly one family of seven and another of eleven including adults, who came to the

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[1] Read before the Section on Pediatrics, New York Academy of Medicine, March 13, 1919.